Climate Change and Human Health Literature Portal

National Institute of
Environmental Health Sciences

Comparing exposure metrics for classifying 'dangerous heat' in heat wave and health warning systems

Author(s):	Zhang K, Rood RB, Michailidis G, Oswald EM, Schwartz JD, Zanobetti A, Ebi KL, O'Neill MS
Year:	2012
Journal:	Environment International. 46: 23-29

Abstract:

Heat waves have been linked to excess mortality and morbidity, and are projected to increase in frequency and intensity with a warming climate. This study compares exposure metrics to trigger heat wave and health warning systems (HHWS), and introduces a novel multi-level hybrid clustering method to identify potential dangerously hot days. Two-level and three-level hybrid clustering analysis as well as common indices used to trigger HHWS, including spatial synoptic classification (SSC), and the 90th, 95th, and 99th percentiles of minimum and relative minimum temperature (using a 10 day reference period), were calculated using a summertime weather dataset in Detroit from 1976 to 2006. The days classified as 'hot' with hybrid clustering analysis, SSC, minimum and relative minimum temperature methods differed by method type. SSC tended to include the days with, on average, 2.5 degrees C lower daily minimum temperature and 5.3 degrees C lower dew point than days identified by other methods. These metrics were evaluated by comparing their performance in predicting excess daily mortality. The 99th percentile of minimum temperature was generally the most predictive, followed by the three-level hybrid clustering method, the 95th percentile of minimum temperature, SSC and others. Our proposed clustering framework has more flexibility and requires less substantial meteorological prior information than the synoptic classification methods. Comparison of these metrics in predicting excess daily mortality suggests that metrics thought to better characterize physiological heat stress by considering several weather conditions simultaneously may not be the same metrics that are better at predicting heat-related mortality, which has significant implications in HHWSs.

Source: http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3401591

Resource Description

Early Warning System: ⊠

resource focus on systems used to warn populations of high temperatures, extreme weather, or other elements of climate change to prevent harm to health

 A focus of content

Exposure : ⊠

weather or climate related pathway by which climate change affects health

 Temperature, Other Exposure

Temperature: Extreme Heat, Fluctuations

Other Exposure: dew point

Geographic Feature: ☒

resource focuses on specific type of geography

 Urban

Geographic Location: ☒

resource focuses on specific location

 United States

Health Impact: ☒

specification of health effect or disease related to climate change exposure

 Morbidity/Mortality

Mitigation/Adaptation: ☒

mitigation or adaptation strategy is a focus of resource

 Adaptation

Model/Methodology: ☒

type of model used or methodology development is a focus of resource

 Outcome Change Prediction

Resource Type: ☒

format or standard characteristic of resource

 Research Article, Research Article

Timescale: ☒

time period studied

 Short-Term (

Vulnerability/Impact Assessment: ☒

resource focus on process of identifying, quantifying, and prioritizing vulnerabilities in a system

 A focus of content